Abstract

A scaled-up multi-coaxial fiber bioreactor, and variations of this bioreactor. The device is characterized by a hollow housing and an array of from about 20 to about 400 modules of hollow fibers, where each module includes at least three coaxial semipermeable hollow fibers. The innermost fiber provides a boundary for an innermost compartment which is connected to inlet and outlet ports. Arranged coaxially around the central hollow fiber are several other hollow fibers with their respective compartments, each compartment defined by a respective annular space between adjacent fibers and each including inlet and outlet ports. An outermost compartment for permitting integral aeration is the space between the outer side of the outermost fibers and the inner side of the housing, and has inlet and outlet ports. The hollow housing has inlet and outlet manifolds and flow distributors for each of the compartments. In a preferred embodiment the bioreactor is used as an extracorporeal liver. Liver cells, are introduced into one or more annular compartments and media and aeration are provided in others. Plasma from an ailing patient is introduced into another compartment for biotransformation of blood-borne toxins and biosynthesis of proteins, lipids, and other metabolic products.